NRCS Technology News

July/August 2004

"NRCS *Technology News,"* provided by Science and Technology, delivers pertinent information to our customers about new technology, products, and services available from the Soil Survey and Resource Assessment and the Science and Technology deputy areas.

Features in this issue include:

MEETINGS

MESSAGE FROM THE DEPUTY CHIEFS

Computer Technology Transforms Soil Survey in the 21st Century

Lawrence E. Clark and Maurice J. Mausbach

Clark

Mausbach

Most everyone agrees that computer technology is rapidly changing our world and the way we live. Field soil surveyors involved in soil mapping projects recognize the current and future effects of computer technology in improving their capability to display unique soil areas on traditional paper maps and electronically using Geographical Information Systems (GIS) technology. The Soil-Land Inference Model (SoLIM) and other GIS-based soil landscape analysis projects are being developed to help soil scientists produce soil surveys more efficiently and to improve the availability of soil information.

The SoLIM procedure captures the relationships of soils to landforms in landscape models that soil scientists develop mentally while walking the woods and fields, examining soils with augers and sharpshooter shovels, and studying various information sources about soil environmental factors. Their knowledge of landscape models is then processed within a computer to prepare soil maps to be verified by soil scientists in the field. The careful recording of soil landscape models is a noteworthy outcome of the SoLIM method. It preserves the human knowledge acquired through traditional soil survey activities that may be lost as soil scientists retire or relocate to new survey areas.

The SoLIM procedure is a repetitive process requiring soil scientists to continually update and refine their landscape models as they discover new information about the soil environmental factors during a project survey. The soil environmental factors are Dr. Hans Jenny's classic five factors of soil formation: parent materials (geology), climate, relief or topography, organisms (plants, animals, humans), and time. After soil mapping is completed, conservation planners and others use the soil maps and landscape models to help them better understand soil interpretations for land use and management decisions.

The SoLIM project is collaborative research with the Department of Geography, University of Wisconsin-Madison supported by the NRCS Soil Survey Division and the Wisconsin NRCS. The research objective is to improve the accuracy, quality, detail, and long-term usefulness of soil surveys. The SoLIM technology has three primary, independent components: (1) computer-based GIS programs and remote sensing data, (2) knowledge documentation ("capture") of soil environmental factors and landscape models, and (3) an inference model that uses deductive reasoning to predict soil areas on a map.

To predict soil areas with a computer, soil scientists, and geographers identify the different types

of data representing the soil environmental factors and convert the data into an electronic format that can be displayed and analyzed in the GIS program. In Dane County, Wisconsin, where SoLIM is undergoing development, aerial photography and maps of bedrock geology have been scanned or digitized to make them useable by GIS software. Topographic quadrangle maps were also converted into 3-D landscape views or digital elevation models. Within the GIS program, these soil environmental factors are then combined so that various soil landscape models can use the data to predict the different types of soils.

The SoLIM project's early results can be broadly grouped into map products and clear records of soil landscape models. Some examples of map products are the conventional soil area or polygon maps traditionally developed during soil surveys and soil property maps that display the continuous variation across a survey area for a specific soil characteristic, such as sand content in the topsoil layer. Soil landscape models are recorded as 2-D or 3-D diagrams and written descriptions of the environmental conditions where different soils occur.

Soil scientists working in the field may soon use "futuristic" tools, such as a field vest or wristwatch carrying a portable computer, "augmented reality" glasses, video cameras, and global positioning systems and wireless Internet connectivity for accessing satellite imagery and updating computer databases with real-time measurements of soil data. Rapid advances in remote sensing and geophysical tools, such as ground penetrating radar and electromagnetic induction meters, could be combined with computer-assisted soil landscape analysis methods, such as SoLIM. Using these technologies, field soil scientists will rapidly identify and draw different soils while accurately measuring their associated properties, such as the depth to bedrock or the distributions of soluble salts, without disturbing the soil.

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CONSERVATIONIST'S CORNER

David P. Doss, State Conservationist, Maryland

David P. Doss

NRCS Maryland uses the resources of the NRCS National Science and Technology Consortium to enhance the conservation technical assistance services it provides to conservation partners and landowners. A prime example of this is the science-based leadership role that NRCS Maryland has established in nutrient management activities.

NRCS Maryland continues to collaborate with NRCS consortium members, including the Ecological Sciences Division, the Soil Quality Institute, and the National Water and Climate Center, and also with local partners, such as the University of Maryland and the Maryland Department of Agriculture. One collaboration focuses on evolving nutrient management technology, like the recently developed Phosphorus Index, specific to the state of Maryland. The Phosphorus Index is a risk assessment tool that enables us to evaluate the potential for phosphorus to move into the environment. Cutting-edge research now indicates that phosphorus can move off a field when the soil reaches saturation levels. This is especially true on land where a large amount of chicken manure has been applied.

Another area where NRCS Maryland worked with consortium partners to obtain the latest science and technology was in evaluating data used to establish conservation practices for the early planting of cover crops. These crops are planted to sequester nutrients leftover from previous crops. Based upon research funded by NRCS, and other partners, NRCS Maryland is now enhancing a Maryland Department of Agriculture cost-share program for cover crops through a $10 per acre incentive bonus through the Environmental Quality Incentives Program (EQIP). The incentive bonus is available to farmers who plant cover crops early (by October 1, 2004). The early emphasis that NRCS Maryland placed on scientific collaboration with partners on this practice demonstrates the environmental benefits of early planting of cover crops. NRCS Maryland anticipates an enthusiastic response to this new incentive offered as an EQIP practice.

One science that continues to be in high demand in Maryland is for nutrient management planners. Maryland State Law established mandatory nutrient management practices for working farms. Maryland is viewed throughout the agribusiness industry as having some of the most rigorous nutrient management laws in the Nation. As a result of the increased need for planners, NRCS Maryland tapped into the existing Maryland Department of Agriculture's certification program for nutrient management planners as a first and best resource for obtaining Technical Service Providers. Currently, more than 1,000 people are certified through this Maryland State program.

NRCS Maryland also offers technical assistance and financial cost-share assistance on nutrient management through EQIP. This provides for both an incentive payment to the producer to develop a plan and an opportunity for payment where the producer obtains services from a commercial Technical Service Provider.

By using state-of-the-art science and partnership technical resources from groups like the NRCS National Science and Technology Consortium, NRCS Maryland continues to be a technology leader in the field of nutrient management.

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NEW PRODUCTS AND SERVICES

#1 Regional Guidebook on Applying the Hydrogeomorphic Approach to Wetlands Released

A new wetland functional assessment publication entitled "Regional Guidebook for Applying the Hydrogeomorphic Approach to Assessing Wetland Functions of Rainwater Basin Depressional Wetlands in Nebraska" has been released. This publication was developed by representatives of the Natural Resources Conservation Service, United States Army Corps of Engineers, and Nebraska Game and Parks.

The Hydrogeomorphic (HGM) Approach is a method for developing functional indices and the protocols applied in the assessment of wetland functions at a site-specific scale. The HGM Approach was initially designed to be used in the context of the Clean Water Act, Section 404 Regulatory Program, as a way to permit review to analyze project alternatives, minimize impacts, assess unavoidable impacts, determine mitigation requirements, and monitor the

success of compensatory mitigation. However, a variety of other potential uses have been identified, including the determination of minimal effects under the Food Security Act, design of wetland restoration projects, and management of wetlands.

The guidebook uses the HGM Approach to: (a) characterize ponded, herbaceous marshes on the loess plain of south-central Nebraska, (b) provide the rationale used to select functions of ponded, herbaceous depressional marsh subclass, (c) provide the rationale used to select model variables and metrics, (d) provide the rationale used to develop assessment models, (e) provide data from reference wetlands and document its use in calibrating model variables and assessment models, and (f) outline the necessary protocols for applying the functional indices to the assessment of wetland functions.

The guidebook is now available online as a downloadable .pdf file at http://www.wes.army.mil/el/wetlands/wlpubs.html.

For more information, contact:
Michael Whited
Wetlands Science Institute
413-253-8624
michael_whited@fws.gov

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#2 Action Plan for Fish, Wildlife, and Wetlands Under Development

In December 2003, NRCS Chief Bruce Knight charged a team of Agency biologists, program managers, and partners to review the fish, wildlife, and wetlands needs of the Agency. They were asked to develop a list of priority actions to be taken in the near term to maximize Agency effectiveness in meeting wildlife and wetlands objectives.

Cypress/tupelo wetland in central Mississippi. Photo courtesy of USDA NRCS.

A summary report identified 178 specific needs and issues related to fish, wildlife, and wetlands. It was noted that the Wildlife Habitat Management Institute and Wetlands Science Institute were already addressing a majority of the identified technology needs. Thirty-one of these needs were identified through a facilitated prioritization process as high-priority. The majority of needs identified related to Agency policy and program management (65 %), with the remainder related to technology development and transfer needs (35%).

These data illustrate that while developing and maintaining state-of-the-art technology is critical to effectively address fish, wildlife, and wetlands issues, timely policy and management support is paramount to moving the treatment of these natural resource concerns forward. As a follow-up to that report, Randy Gray and a team of Institute biologists have been asked to develop an action plan for fish, wildlife, and wetlands for the Agency.

For more information, contact:
Pete Heard
Wildlife Habitat Management Institute
601-607-3131
lph@ms.nrcs.usda.gov

or

Billy Teels
Wetlands Science Institute
301-497-5938
billy_teels@usgs.gov

or

Randy Gray
Ecological Sciences Division
202-690-0856
randall.gray@usda.gov

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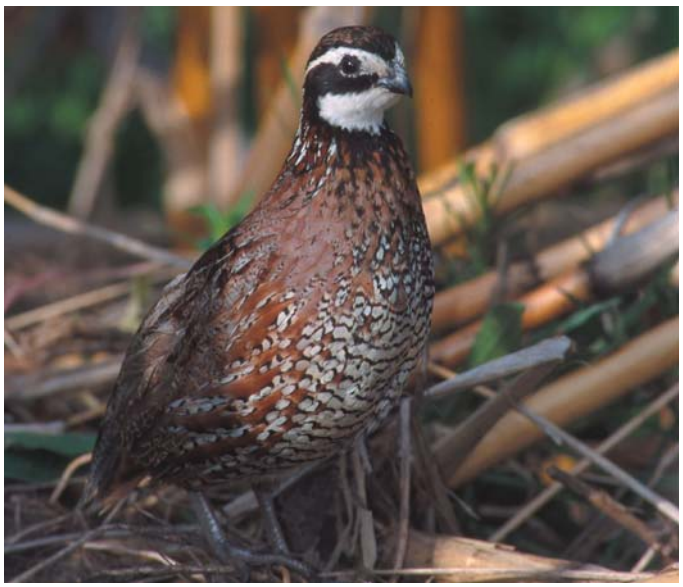
#3 Request for Proposals for Northern Bobwhite Project Released



Northern Bobwhite. Photo courtesy of USDA NRCS Wildlife Habitat Management Institute.

The Wildlife Habitat Management Institute (WHMI), partnering with Mississippi State University (MSU), recently disseminated a Request for Proposals (RFP). This request solicits projects that will evaluate the effects of NRCS Farm Bill conservation practices on northern bobwhite and other early successional wildlife habitat. The work coincides with the new NRCS cooperative effort to partner with the Southeastern Association of Fish and Wildlife Agencies, Quail Unlimited, Inc., and Mississippi State University to achieve the goals of the Northern Bobwhite Conservation Initiative. NRCS Chief Bruce Knight signed the agreement with MSU and other partners to conduct this work.

The RFPs will be received by leader, Dr. Wes Burger, and evaluated by a technical team and an oversight team. The teams are composed of NRCS representatives and a number of partners. The proposal selection, led by WHMI director Pete Heard, will take place this summer. A detailed description of the effort is available through WHMI.

For more information, contact:

Pete Heard
Wildlife Habitat Management Institute
601-607-3131
lph@ms.nrcs.usda.gov

or

Ed Hackett
Wildlife Habitat Management Institute
601-607-3131
ehackett@ms.nrcs.usda.gov

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TECHNOLOGICAL ADVANCES

#4 Soil Moisture Monitoring Expands

With drought increasing in frequency and intensity, it is critically important to improve our understanding of how soil moisture interacts with climate. NRCS is leading a cooperative soil moisture monitoring effort called the Soil Climate Analysis Networking (SCAN). This year, Chief Knight increased the level of funding for the SCAN, allowing it to expand and support conservation planning more effectively.

Currently, the SCAN network consists of 93 automated monitoring stations in 39 states. The last 2 years have seen a marked increase in data collection and information usage. In FY 2003, new stations were installed in Arkansas, Kentucky, Ohio, Oregon, South Dakota, and Tennessee. In FY 2004, NRCS offices requested 10 additional stations. These 10 stations are being installed in Arkansas, Kansas, Mississippi, and Virginia. The stations will be used to support soil survey operations and to make drought monitoring assessments.

Point remove SCAN station, Arkansas. Photo courtesy of USDA NRCS National Water and Climate Center.

Many stations are being actively used by local farmers and ranchers to determine the correct time to plant crops,

irrigation water management activities, and when to apply fertilizers and other chemicals. In addition to supporting the local farmers and ranchers, SCAN stations support many research needs. The SCAN network provides important information to support drought mitigation responses and other agricultural decisionmaking activities. SCAN data are available in real-time at the following Web site http://www.wcc.nrcs.usda.gov/scan.

For more information contact:
Garry L. Schaefer
National Water and Climate Center
503-414-3068
gschaefer@wcc.nrcs.usda.gov

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#5 An Update on Pest Management in the CSP and the CEAP

The first Conservation Security Program sign up is scheduled for July. Adequate protection of soil and water quality is required to qualify for and participate in the program. The three water quality issues included in this first signup are nutrient management, animal waste, and pest management.

Pesticide application on leaf lettuce in Yuma, Arizona. Photo courtesy of USDA NRCS.

Qualification criteria for pest management are defined by a state's pest management practice standard. At the end of March, approximately 70 percent of the states had state-specific pest management standards in their Field Office Technical Guide (FOTG). The remaining states are currently developing a standard in accordance with the pest management policy released in 2001. The deadline for full implementation of the new pest management policy was June 1, 2004. The National Water and Climate Center (NWCC) Pest Management Team has been preparing NRCS pest management technology for this new endeavor.

The following activities have been completed or are in progress:

- A revised pesticide database for the Windows Pesticide Screening Tool (WIN-PST) was completed and released to states in January. This database, including download and installation instructions, is available at http://www.wcc.nrcs.usda.gov/pestmgt/winpst.html.

- The Conservation Practice Physical Effects document in section IV of the FOTG has been updated. The pest management practice has now been rated for effectiveness at addressing each of the 71 resource concerns. The NWCC Pest Management Team also rated each national conservation practice for effectiveness in addressing pesticides in groundwater, pesticides in surface water, and pesticide drift.

- A new version of WIN-PST is being developed to incorporate improvements requested by program users. This version will allow users to save pesticide and soil groupings by common resource area or other appropriate criteria. More user-friendly reports will be available, and users will be able to export interaction and hazard ratings to other applications. The project is scheduled to be completed in 2004.

The environmental risks of pest management will be evaluated in the national Conservation Effects Assessment Project modeling effort. Farmer surveys will provide site-specific pest management information at selected Natural Resources Inventory points. The data will be used to parameterize national EPIC/APEX model runs. The goal of this effort is to characterize how many conservation practices applied for other purposes can also reduce pest management environmental risks. Alternative pest management techniques will also be modeled to demonstrate how full application of the new NRCS pest management standard would protect natural resources.

For more information, contact:
Ken Pfeiffer
National Water Climate Center
503-414-3061
kpfeiffer@wcc.nrcs.usda.gov
or

Joe Bagdon
National Water and Climate Center
413-253-4376
joseph.bagdon@ma.usda.gov

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WEB-BASED TECHNOLOGY

#6 News Feature Added to Soils Web site

The NRCS soils Web site has added a new feature topic area called "Soils in the News." This feature provides users an opportunity to scan current soil topics and view related news articles. Some articles concerning soil survey and soil education have been selected from the Google news search at: http://news.google.com. Other article topics include use of soil survey for tax assessment, location of building sites, wetland delineation and protection, preservation of prime farmland, release of new soil survey publications, failed septic systems, trench safety, zoning, soil education, and envirothons. Additionally, some of the articles feature various people from the NRCS soil survey program.

Articles rotate on and off the Web as new articles are posted. The soil information varies and is significant to diverse groups of users. The range of news article topics speaks well for the value of soil survey. To access the "Soils in the News" feature, visit the NRCS soils Web site at http://soils.usda.gov.

For additional information, contact:
Gary Muckel
National Soil Survey Center
402-437-4148
gary.muckel@nssc.nrcs.usda.gov

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#7 Another Record Month for the National PLANTS Database

With 17.8 million hits for the month of May, the National PLANTS Database recorded another usage record. Additionally, 3.1 million pages of information were served and there were 570,679 extended sessions on the Web site. Over the past 6 years, there has been a traditional increase in usage during the month of May with some years logging increases of approximately 100 percent. To visit PLANTS, go to http://plants.usda.gov.

Calochortus nuttallii.
Photo courtesy of USDA NRCS PLANTS Database.

For more information contact:
Scott Peterson
National Plant Data Center
(225) 775-6280 x 11
speterson@po.nrcs.usda.gov

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TRAINING

#8 *The Leader in You* Transfers to the National Employee Development Center

The Social Sciences Institute (SSI) and the National Employee Development Center (NEDC) have been the primary sponsors of *The Leader in You* series in recent years. The series' videotape lending library and live satellite seminar management has been transferred from the Social Sciences Institute to the National Employee Development Center.

The Leader in You series was developed in 1996 to provide cutting edge leadership programming to The Conservation Partnership. It has been managed for the past 8 years by SSI's Grand Rapids, Michigan, office under the direction of Barbara Wallace, national community conservation relations manager. Wallace plans to retire this summer. *The Leader in You* program coordinator, Becky Noricks, will complete her graduate degree.

The series has grown in popularity over the years with over 1,200 participant handout downloads for the April 2004 live seminar, "Leaders at All Levels" with Laree Kiely. The series' popularity has increased because of the live seminar and lending library's accessibility, as well as the series' relevance to current issues facing the partnership in the areas of leadership, change, marketing, and communication. *The Leader in You* program is offered at no cost to staff and directors of NRCS, National Association of Conservation Districts, and the National Association of State Conservation Agencies.

The National Employee Development Center will also manage *The Leader in You*'s lending library. All videotape requests for the series should be directed to Georgia Spiller at 817-509-3254 or gspiller@ftw.nrcs.usda.gov.

For more information, contact:
Barbara Wallace
Social Sciences Institute
616-942-1503
barbara.wallace@usda.gov

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NEW PERSONNEL APPOINTMENTS

#9 Chief Knight Names New National Technology Support Center Directors

NRCS Chief Bruce Knight has announced the three new National Technology Support Center directors. William E. Puckett has been named center director in the East region. The center will be located in Greensboro, NC. Ronald C. Williams was selected the center director for the Central region in Ft. Worth, TX. Bruce J. Newton will be the center director in the West region, located in Portland, OR. The directors will begin their positions on July 25, 2004.

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MEETINGS

#10 Clark Attends West African Ministerial Conference on Agricultural Science and Technologies

Lawrence Clark, deputy chief of NRCS Science and Technology, recently returned from a West African-focused ministerial conference on agricultural science and technologies in Ouagadougou, Burkina Faso. The conference's main focus was working with developing countries to help them manage water for agriculture and sanitation more effectively. The conference was co-sponsored by U.S. Department of Agriculture, the U.S. Department of State, and the U.S. Agency for International Development.

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NRCS TECHNOLOGY NEWS

Bruce Knight, Chief, Natural Resources Conservation Service
Lawrence E. Clark, Deputy Chief for Science and Technology
Maurice J. Mausbach, Deputy Chief for Soil Survey and Resource Assessment

NRCS Science and Technology Consortium staff should send information for ***NRCS Technology News*** to:

Barbara Wallace, Editor
Social Sciences Institute
616-942-1503
barbara.wallace@usda.gov

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